

### **Remarks**

Claims 1-26 are pending in the application. Claims 1, 2, 17 and 22-26 are rejected, while claims 3-12, 15, 16 and 18-21 are objected to. By this paper, claims 1, 14 and 22 are amended. Based on the following, consideration of the amended claims, and reconsideration of the remaining claims, are requested.

### **Specification**

By this paper, paragraph 48 of the Specification is amended to correct a typographical error. In particular, two different gains ( $K_{ff}$  and  $K_{p1}$ ) are described, and near the end of the paragraph, numerical values for these gains are chosen. In particular, the text reads that one choice is " $K_{ff}=1$  and  $K_p=0$ ". The second gain term should have been written as " $K_{p1}=0$ ". By this paper, this inadvertent error has been corrected.

### **Claim Rejections—35 U.S.C. § 102**

The Examiner rejected claims 1, 2, 17 and 22-26 under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 6,295,500 (Cullen et al.). Although not listed in the introductory paragraph, claim 14 is discussed in conjunction with claim 1, and is therefore assumed to be rejected under the same reference. By this paper, claim 14 is amended to more particularly point out and distinctly claim the subject matter of the invention. Specifically, claim 14 recites a method for controlling a vehicle using nonlinear error-based control. The method includes the step of "applying a first gain to the first error, thereby producing a first vehicle request, the first gain being a non-decreasing function of the absolute value of the first error." No such elements are expressly or inherently described in Cullen et al.

In Column 4, Lines 44-54 of Cullen et al., the determination of an acceleration term is described. Specifically, Cullen et al. states that "desired acceleration from speed control ( $accl\_spd\_req$ ) is determined based on a vehicle speed error between a set speed and an actual vehicle speed." Cullen et al. further states that "the vehicle speed error is used in conjunction with

a nonlinear gain function to produce (accl\_spd\_req)." In particular, Cullen et al. describes that "when speed error is between first and second speed error limits, accl\_spd\_req is linearly related to speed error...[and] [o]utside these speed error limits, desired acceleration may be limited to a fixed value...." In summary, what Cullen et al. describes is an acceleration term that is the product of a gain and a speed error, and between first and second speed error limits, the acceleration term is linearly related to the speed error. Such a situation may occur, for example, when the gain function is a constant between these two speed error limits. Outside the speed error limits, however, Cullen et al. states that the acceleration is limited to a fixed value. In order for the acceleration to remain at a fixed value while the speed error increases, the gain function must decrease, and it must decrease in a nonlinear fashion. Therefore, the nonlinear portion of the gain function described in Cullen et al. exists outside the speed error limits, and in order to keep the acceleration term constant while the speed error term increases, the gain function is a nonlinear *decreasing* function.

The method for controlling a vehicle described in amended claim 14 of the present application is readily distinguished from the method described in Cullen et al. In particular, amended claim 14 expressly recites that a first gain is applied to the first error to produce a first vehicle request, and "the first gain [is] a non-decreasing function of the absolute value of the first error." As described in the specification of the present application, the non-decreasing gain provides a more aggressive control when the error is large and the vehicle is operating far away from its target value—e.g., see Specification at Paragraph 35. This is the opposite of the type of gain applied in Cullen et al., which must decrease in order to maintain the acceleration term at a fixed value. Not only does Cullen et al. fail to expressly describe the elements of amended claim 14, it also fails to inherently describe such elements—i.e., it cannot be stated that a non-decreasing gain function is inherent in a decreasing gain function. Therefore, Applicant maintains that amended claim 14 is not anticipated by Cullen et al. Claim 17 depends directly from amended claim 14, and therefore Applicant maintains that it is also not anticipated by Cullen et al.

By this paper, claim 1 of the present application is amended to more particularly point out and distinctly claim the subject matter of the invention. For example, amended claim 1 recites a method for controlling a vehicle using a nonlinear error-based control that includes the

step of "determining a first vehicle request, the first vehicle request being a nonlinear, increasing function of the first error." Using, for example, a gain that is a non-decreasing function of the error term (as described in the Specification and discussed above) provides a vehicle request that is an increasing function. In particular, where the gain increases with an increase in the error term, the vehicle request will increase quadratically with the speed error. Where the gain is constant (also non-decreasing), the vehicle request will also increase with an increase in the speed error, but it will do so linearly rather than quadratically.

As described in the Specification of the present application, this type of increasing function is advantageous, because it provides a more aggressive control as the vehicle request gets farther from its target value—i.e., as the error term increases. In contrast, Column 4, Lines 44-54 of Cullen et al. describe the use of a nonlinear gain function to produce a vehicle acceleration term. Cullen et al. expressly states that within the first and second speed error limits, the acceleration term "is linearly related to the speed error," and that outside these speed error limits the acceleration term is "limited to a fixed value;" this is not an increasing function as expressly recited in amended claim 1 of the present application. For example, outside the speed error limits, as the error increases significantly, the acceleration term of Cullen et al. will remain constant. This does not provide the kind of control available with an increasing function as recited in amended claim 1. Therefore, Cullen et al. cannot be said to expressly or inherently describe all of the elements of claim 1 of the present application, and Applicant maintains that amended claim 1 is not anticipated by that reference. Claim 2 depends directly from amended claim 1, and is therefore also not anticipated by Cullen et al.

By this paper, claim 22 of the present application is amended to more particularly point out and distinctly claim the subject matter of the invention. In particular, it recites a vehicle that includes a controller that is configured to perform a number of functions, including determining a first error and a vehicle request. As recited in amended claim 22, "the vehicle request [is] a nonlinear, increasing function of the first error." Thus, the analysis provided above with regard to amended claim 1 and Cullen et al. is also applicable to amended claim 22. Cullen et al. describes determining a vehicle acceleration request, but expressly states that outside the speed error limits, the vehicle acceleration request is constant. This is not an increasing function

as expressly recited in amended claim 22; it is a different control mechanism. Therefore, Cullen et al. also fails to inherently describe the elements of amended claim 22 of the present application. Amended claim 22 is the base claim for claims 23-26. Each of these dependent claims contains all of the limitations of amended claim 22, as well as additional limitations that further distinguish it from the cited reference. Therefore, Applicant maintains that claims 22-26 are not anticipated by Cullen et al.

**Allowable Subject Matter**

The Examiner objected to claims 3-12, 15, 16 and 18-21 as being dependent upon a rejected base claim, but indicated that each would be allowable if written in independent form to include all of the limitations of its respective base claim and any intervening claims. As discussed in detail above, amended claim 1 and amended claim 14—the base claims for these dependent claims—are each believed to be allowable. Therefore, Applicant respectfully requests withdrawal of the objections to these dependent claims. Based on the foregoing, allowance of each of the pending claims is requested.

Please charge any fees or credit any overpayments as a result of the filing of this paper to Ford Global Technologies, LLC Deposit Account No. 06-1510.

Respectfully submitted,

**Diana Yanakiev**

By /Marc F. Malooley/

Marc F. Malooley

Reg. No. 50,624

Attorney/Agent for Applicant

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**BROOKS KUSHMAN P.C.**  
1000 Town Center, 22nd Floor  
Southfield, MI 48075-1238  
Phone: 248-358-4400  
Fax: 248-358-3351